

WHAT IS CLAIMED IS:

1. A stem cell expansion factor comprising a blocker which reduces expression level of at least one gene normally limiting HOX-induced expansion of stem cells, whereby reducing expression level of said gene enhances expansion of stem cells containing a HOX peptide.
2. The stem cell expansion factor of claim 1, wherein said blocker is selected from the group consisting of an antisense, an antibody, a SiRNA, a peptide and a chemical compound.
3. The stem cell expansion factor of claim 1, wherein said gene is a PBX gene.
4. The stem cell expansion factor of claim 3, wherein said blocker is a nucleic acid sequence blocking PBX expression.
5. The stem cell expansion factor of claim 4, wherein said blocker is an antisense DNA to PBX1.
6. The stem cell expansion factor of claim 1, wherein said blocker is a PBX1 expression blocker.
7. The stem cell expansion factor of claim 1, wherein said stem cells are hematopoietic stem cells.
8. The stem cell expansion factor of claim 7, wherein said hematopoietic stem cells are human or mouse hematopoietic stem cells.

9. A nucleic acid construct for enhancing stem cells expansion, said construct comprising a first nucleic acid sequence for expression of a HOX peptide, wherein said peptide being able to cross a cell membrane, and a second nucleic acid sequence blocking expression of at least one gene normally limiting HOX-induced expansion of stem cells, whereby reducing expression level of said gene in the presence of a HOX peptide enhances expansion of stem cells.
10. The construct of claim 9, wherein said gene is a PBX gene.
11. The construct of claim 9, wherein said HOX peptide is a HOXB4 peptide.
12. The construct of claim 9, wherein said stem cells are hematopoietic stem cells.
13. The construct of claim 12, wherein said hematopoietic stem cells are human or mouse hematopoietic stem cells.
14. The construct of claim 10, wherein said second nucleic acid sequence blocking PBX expression is an antisense DNA to PBX1.
15. A composition for enhancing expansion of stem cells comprising an amino acid sequence having the activity of a HOX peptide, wherein said peptide being able to cross a cell membrane, and a blocker which reduces expression level of at least one gene normally limiting HOX-induced expansion of stem cells, whereby reducing expression level of said gene in the presence of a HOX peptide enhances expansion of stem cells.
16. The composition of claim 15, wherein said gene is a PBX gene.

17. The composition according to claim 15, wherein said amino acid sequence consists of a HOXB4 peptide.
18. The composition according to claim 15, wherein said amino acid sequence comprises an HIV-derived peptide able to cross a cell membrane.
19. The composition according to claim 18, wherein said HIV-derived peptide consists of a NH₂-terminal protein transduction domain (PTD) from a transactivating protein.
20. The composition according to claim 15, wherein said stem cells are hematopoietic stem cells.
21. The composition according to claim 20, wherein said hematopoietic stem cells are human or mouse hematopoietic stem cells.
22. The composition according to claim 16, wherein said blocker is a nucleic acid sequence blocking PBX expression.
23. The composition according to claim 22, wherein said blocker is an antisense DNA to PBX1.
24. A composition for enhancing expansion of stem cells comprising a nucleic acid sequence for over-expression of a HOX peptide, and a blocker which reduces expression level of at least one gene normally limiting HOX-induced expansion of stem cells, whereby reducing expression level of said gene in the presence of a over-expressed HOX peptide enhances expansion of stem cells.
25. The composition of claim 24, wherein said gene is a PBX gene.

26. The composition according to claim 24, wherein said HOX peptide is a HOXB4 peptide.
27. The composition according to claim 24, wherein said stem cells are hematopoietic stem cells.
28. The composition according to claim 27, wherein said hematopoietic stem cells are human or mouse hematopoietic stem cells.
29. The composition according to claim 24, wherein said blocker is a nucleic acid sequence blocking PBX expression.
30. The composition according to claim 29, wherein said blocker is an antisense DNA to PBX1.
31. A method for enhancing expansion of stem cells, which comprises treating stem cells with an effective amount of a factor as defined in any one of claims 1 to 8, or an effective amount of a composition as defined in any one of claims 15 to 30 for a time sufficient to allow expansion of said stem cells.
32. The method of claim 31, wherein said HOX peptide is a HOXB4 peptide and said gene is PBX.
33. The method of claim 31, further comprising a step of treating said stem cell with an amino acid sequence having the activity of a HOX peptide encoded by a HOX nucleotide sequence.
34. The method of claim 33, wherein said amino acid sequence consists of a HOXB4 peptide.

35. The method of claim 33 or 34, wherein said amino acid sequence comprises an HIV-derived peptide able to cross a cell membrane.
36. The method of claim 35, wherein said HIV-derived peptide consists of a NH₂-terminal protein transduction domain (PTD) from a transactivating protein.
37. The method of claim 31, wherein said stem cells are hematopoietic stem cells.
38. The method of claim 37, wherein said hematopoietic stem cells are human or mouse hematopoietic stem cells.
39. The method of anyone of claims 31 to 38, wherein said stem cells are treated *in vitro*, *in vivo* or *ex vivo*.
40. Use of a factor as defined in any one of claims 1 to 8, or a construct as defined in any one of claims 9 to 14, a composition as defined in any one of claims 15 to 30 for the preparation of a medicament for restoring hematopoietic capability of a patient.